Automatic Publication of a MIS Product to GeoNetwork
Case of the AIS Indexer

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Abstract

An Automatic Identification System (AIS) reception indexer Java application was developed in the summer of 2011, based on the work of Lapinski and Isenor (Estimating Reception Coverage Characteristics of AIS, Lapinski and Isenor, Journal of Navigation, October 2011 [1]). This application gathers AIS messages and produces a coverage map, graphically representing the quality and fidelity of signals received by coastal sensors. The application gathers its inputs either from static data files or a streaming input source. OODA Technologies improved the application in 2012 under call-ups 5 [2] and 6 [3, 4] to the standing offer W7707-115137. Several bugs were fixed, performance was improved, an alert system algorithm was implemented, several features were added and usability was improved.

During the same period, an investigation was conducted by OODA Technologies, under call-up number 4 to the standing offer W7707-115137, about the feasibility of using the open source GeoNetwork application for information product management and access within TRINITY. As a result, GeoNetwork is being installed by MARLANT N6 in the Integrated Testing Environment (ITE) for TRINITY.

This work involves the development of an application, the GeoNetwork Publisher (GNP), that automatically publishes to GeoNetwork AIS index reception maps produced by the AIS Indexer. Currently, the AIS Indexer interfaces with the GNP to publish maps. The GNP can however be re-used for the publication of other products. The use of GNP reduces the overhead of producing metadata for every publication and thus ultimately encourages Geonetwork usage. The GNP is part of a global effort to distribute and manage Maritime Information Support (MIS) products.

i

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Table of contents

List of figures

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1 Introduction

In 2011, Defence Research and Development Canada (DRDC) Atlantic's Maritime Information and Combat Systems Section was requested by Canadian Forces Intelligence staff to investigate the capabilities and applicability of GeoNetwork for use in managing geospatial information products. The investigation was a contracted effort with OODA Technologies Inc.

This investigation has shown that GeoNetwork is a viable geospatial product management system for Department of National Defence (DND) TRINITY. It provides product storage and advertisement, allowing for users to search and discover relevant products based on various criteria. As a result, GeoNetwork is being installed by MARLANT N6 in the ITE for TRINITY. It has also been shown that GeoNetwork would be a viable means for the DRDC Atlantic MIS group to broadcast their research products. Moreover, the harvesting mechanism would allow both GeoNetwork instances (N6 and MIS) to communicate and share Maritime Situational Awareness (MSA) products.

Publishing a product to GeoNetwork requires the creation of metadata to describe the product and enable its discovery. The creation of quality metadata necessitates extra efforts and could bring resistance to GeoNetwork full adoption.

OODA Technologies investigated the possibility of publishing automatically a product to GeoNetwork. As a result, the GNP was developed by OODA Technologies Inc. and integrated into the AIS Indexer (see [3] and [4] for more details about the AIS indexer). This application creates automatically the required Marine Community Profile (MCP) [7] compliant metadata based on a template and publishes AIS coverage index maps produced by the AIS Indexer to GeoNetwork. This application opens the door to a structured, easier and broader communication of MIS research efforts.

The GNP assumes the following:
- There is an up and running instance of GeoNetwork available on the network [1].
- The GeoNetwork instance's Uniform Resource Locator (URL) and administrator credentials (login, password) are known.
- The file for publication contains geographic information and is pertinent for publication on GeoNetwork as a MIS product.
- The metadata format used is MCP [7].
- Python (at least version 2.6) is installed on the machine used to execute GNP.

The GNP application was developed to publish AIS reception index maps (see [1, 8]), but can be modified to publish other products. Figure 1 shows the AIS Indexer's product as it appears after being published by the GNP.

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1. The ANZ-MEST software [5] was selected as the most convinient GeoNetwork version to use. The main reason is that it provides embedded support for the MCP. See [6] for more details on ANZ-MEST.

1

The document is broken into the following sections:

1. Section 2 describes the GNP's architecture;
2. Section 3 describes how to use the GNP;
3. Section 4 describes how to reuse the GNP for other products;
4. Annex C details the complete GeoNetwork installation procedure.

Figure 1: *Screen capture of the AIS Indexer's product as it appears in GeoNetwork.*

2   GeoNetwork Publisher

GeoNetwork allows publishers to link their products to the metadata description they publish in the catalogue. The products can be downloaded by clicking on the *Data for Download* button, as illustrated in Figure 1. There are several ways GeoNetwork serves products: using online resources such as Web Map Service (WMS), File Transfer Protocol (FTP) and Hypertext Transfer Protocol (HTTP) servers, or by offering downloadable files. See [6] for more details about how GeoNetwork serves products.

The GNP application is based on the GeoNetwork's capability to use a Metadata Exchange Format (MEF) archive file to create a product available for download. A MEF file is a ZIP file with the following structure:

```
Root
 |
 +--- metadata.xml
 +--- info.xml
 +--- public
 |     +---- all public documents and thumbnails
 +--- private
       +---- all private documents
```

The MEF file contains all the information required by GeoNetwork to create the product and make it available for download.

GeoNetwork provides access to several internal structures through the use of eXtensible Markup Language (XML) services (see [9] for details). The capability to import a MEF file for publication is implemented by the XML service `mef.import`.

The GNP is used to:

1. Produce a product compliant with GeoNetwork from a file with geographic content;
2. Publish automatically the resulting product to GeoNetwork ; and
3. Grant privileges on the product.

It has four main functional components illustrated in figure 2:
- Publisher,
- MEF Builder,
- MEF Importer,
- Privileges Manager.

These components are implemented by 6 Python modules:

- `publish.py`,
- `mef.py`,
- `info.py`,
- `metadata.py`,
- `geonetwork.py` and
- `config.py` that is used for configuration.

This section describes each of the four functional components along with their implementation.
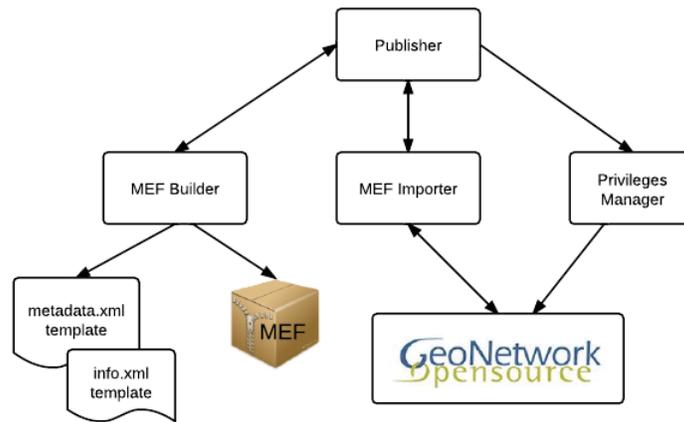
Figure 2: *A functional view of the GeoNetwork Publisher.*

2.1   Publisher

The publisher is the product publication's orchestrator. It calls successively:

1. the MEF Builder to create a product and archive it as a MEF file;
2. the MEF Importer to import the product to GeoNetwork; and
3. the Privileges Manager to grant privileges on the product.

The publisher is implemented by the Python module `publisher.py`.

2.2   MEF Builder

The MEF Builder has three roles:

1. Create the `info.xml` file;
2. Create the `metadata.xml` file; and
3. Produce the MEF file.

4
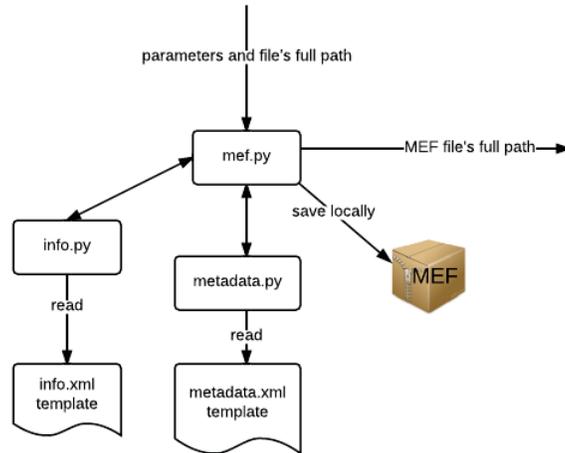
Figure 3: *MEF Builder implementation.*

These three functionalities are implemented respectively by the Python modules: `info.py`, `metadata.py` and `mef.py` (see figure 3).

The `createMef` function of the `mef.py` module calls successively `info.py` and `metadata.py` to create the required XML files and then organizes the files following the MEF structure and archives it. It takes as input the required parameters to create the product. These parameters are values that will change from one publication to another of the same product. In the case of the AIS reception index, these parameters are: geographic bounding box, start and end time of the index computation, and the full path of the map file, and the delta time used in the index algorithm.

The following details how the MEF Builder creates the two XML files and the MEF archive.

2.2.1 XML Files Creation

The files `info.xml` and `metadata.xml` need to be created to produce a valid MEF file. Both of them are generated using a template file, identified in figure 2 and 3 as *info.xml template* and *metadata.xml template*.

A template file is read, loaded into local memory and some of its fields are modified with the input information. These functionalities are implemented by the `info.py` module for the `info.xml` file and by the `metadata.py` for `metadata.xml`. The output of these operations is the XML file content.

The motivation to use a template versus generating the whole XML file for each publication is to reduce the overhead and program complexity. Since only a small portion of each XML file needs to be modified from one publication to another, there is no need to re-generate

the same file over again. The Python lxml toolkit [10] is used to load the content of the template file in memory and modify it.

The following paragraphs describe the specific modifications made to each template.

2.2.1.1 info.xml

The `info.py` module is used to read the `template info.xml` file, load it in local memory and modify some of the fields, namely:

- creation and change date,
- product's Universally Unique Identifier (UUID),
- the GeoNetwork sites's UUID,
- the public and private file names.

The creation and change dates are set to be the metadata creation date, i.e. the time when the publisher is invoked. The product's UUID is created by the GNP while the site UUID is unique to the GeoNetwork instance used for publication (see section 3.3 for more information about this parameter). The public file name is the name of the thumbnail (see section 2.2.2 for details about thumbnail generation) and the private file name refers to the file that will be available for download. The file extension is required in both cases and the full path is not needed for the private file. Note that more than one file can be made available for download. The possible file formats are (by extension):

- Images: bmp, gif, jpg, jpeg, png, swf, tiff, tif and wbmp;
- Applications: gml, wms, kmz and kml;
- Text: txt, html, swf, xhtml and xml;

The `info.xml template` file content for the AIS reception index is listed in annex A.

2.2.1.2 metadata.xml

The `metadata.py` module is used to read the `metadata.xml template` file, load it in local memory and modify some of the fields, namely:

- product's title,
- abstract,
- publication and creation dates,
- thumbnail's name and format,
- revision date,
- geographic bounding box coordinates,
- start and end dates,
- URL, type of file for download and its description.

Here, the creation date is when the product was generated and the publication date refers to the moment the product is published on GeoNetwork, i.e. the current date. The revision date is set to be the same as the publication date.

Note that it is possible to modify `metadata.py` for updating other fields than the ones mentioned above. See section 4 to see how.

The `metadata.xml template` file content for the AIS reception index is listed in Annex B.

2.2.2 MEF File Creation

To produce the MEF file, the MEF Builder creates a temporary directory within a sub directory called `mef` where the GNP is run. This temporary directory, referred here as `mef\tmp`, has the MEF structure described in this section's introduction. The XML content produced by the modules `info.py` and `metadata.py` (see paragraphs 2.2.1.1 and 2.2.1.2) is used to write respectively the `info.xml` and `metadata.xml` files to the `mef\tmp` directory. The file to download is copied to the `mef\tmp\private` directory.

If the file to download is an image [2], the MEF builder will automatically create a thumbnail version of it and write it into the `mef\tmp\public` directory. This thumbnail will be part of the product description within GeoNetwork, as illustrated on the right part of figure 1.

Once all required files have been written in the `mef\tmp`, the MEF Builder zips recursively the content of `mef\tmp` and saves it in the `mef` directory under the name of the product's UUID, e.g. `mef\aa78838b-49ac-46cb-8cd0-359fb0a50aaa.mef`. For each publication, the MEF file is saved in the `mef` directory. If a publication fails, for instance due to a network problem, then the MEF file is available for manual import to GeoNetwork. The output of this operation is the absolute path of the created MEF file.

2.3 MEF Importer

The MEF Importer has a single role: to import the MEF file to GeoNetwork. This functionality is implemented by the `importMef` function of the `geonetwork.py` module. It uses the full path of the MEF file as input and outputs the local Identification Number (ID) of the product provided by GeoNetwork. The local ID is a simple integer and is different from the UUID. This functionality is simply an interface for the GeoNetwork XML service `mef.import`. It connects to GeoNetwork using the administrator credentials (see 3.3 for details about the credentials) and calls the GeoNetwork XML service.

---

2. A file is detected as an image if it has one of the following extensions: bmp, gif, jpg, jpeg, png, swf, tiff, tif or wbmp.

2.4   Privileges Manager

The Privileges Manager is used to give all privileges to a list of groups for a given product. It takes the UUID of the product and the group's IDs as input. The selected groups should be registered to the GeoNetwork instance beforehand. See section 3.3 for details about the groups IDs.

3 Execution

This section describes how to execute the GNP directly or by using an interface. It also describes the required settings and configuration.

3.1 Python

Install Python (at least version 2.6) on the machine used to execute GNP. Python software and instructions for installation can be found in [11].

The GNP requires two extra Python packages:

1. lxml-3.0.2,
2. PIL-1.1.7.

The Windows binaries for both packages can be found here: `http://www.lfd.uci.edu/~gohlke/pythonlibs/`.

3.2 GeoNetwork Settings

As mentioned in the introduction, the GNP requires an up and running instance of GeoNetwork available on the network. See Annex C for installation instructions.

Moreover, the GeoNetwork administrator should have created:
- at least the group that will have full privileges on the products published by the GNP,
- at least one user for each group.

3.3 Configuration

All GNP configuration parameters are defined in `config.py`. This file is read at execution time. Only the following parameters need to be modified:
- `gnUsername`: GeoNetwork administrator's user name (usually *admin*);
- `gnPassword`: GeoNetwork administrator's password;
- `gnServletUrl`: the URL of the GeoNetwork servlet. Use the full Internet Protocol (IP), e.g. `http://70.82.193.119:8080/geonetwork/srv/en`
- `metadataTemplateMCP`: name of the `metadata.xml template` file, e.g. `metadata_template.xml`. It is assumed that there is a copy of this file in the same directory of `publisher.py`.
- `infoTemplate`: name of the `info.xml template` file, e.g. `info_template.xml`. It is assumed that there is a copy of this file in the same directory of `publisher.py`.
- `siteId`: GeoNetwork instance UUID, e.g 9e48e6e4-9bfc-4b7c-9f77-77ac88b27085.

9

- `groupIds`: the list of IDs of the groups that will have full privileges on the product, e.g. [4,7].

There are two ways to get the site's UUID:

1. in a browser, go to `gnServletUrl/geonetwork/srv/en/xml.info?type=site` or
2. execute `getSiteInfo` of the `geonetwork.py` module.

There is no apparent way to grant privileges using the name of the group instead of the ID. To get the group's IDs:

1. in a browser, go to `gnServletUrl/geonetwork/srv/en/xml.group.list` or
2. execute `getGroups` of the `geonetwork.py` module.

3.4 Execution

As mentioned in section 2.1, the publisher orchestrates the product's publication. Therefore, to run the GNP, one must execute `publisher.py` either

1. directly by the command line (see section 3.4.1) or
2. through an interface such as the `Publisher.java` Java interface (see section 3.4.2).

directly

3.4.1 Command Line

The `publish.py` script reads a series of arguments as input. These arguments are used to create the metadata. It requires at least one argument: the product name. In the case of the AIS reception index, the product name is *ais coverage map*.

For example, for the AIS reception index map file `C:\Users\Public\Data\ais_coverage_14hours.png`, with a delta time of 6 minutes, having 2011-02-02 21:33:33 and 2011-02-02 22:33:33 as start and end dates within a bounding box defined by a longitude between -130° and -110° and latitude between 51° and 70°, the command is:

```
> python publish.py "ais coverage map"
"2011-02-02 21:33:33 'UTC'" "2011-02-02 22:33:33 'UTC'"
6 C:\Users\Public\Data\ais_coverage_14hours.png
-- -110.0 -130.0 70.0 51.0
```

The `--` before the bounding box coordinates is used to handle the minus signs. The format for the time is *yyyy-MM-dd HH:mm:ss 'UTC'*.

3.4.2   Publisher Java Class

The Publisher class was developed to integrate the GNP to the AIS reception indexer. It is used to execute the `publish` script. When the user launches the index computation, he is asked if he wants the output map to be published to GeoNetwork. If the answer is yes, the GNP is executed at the end of the map computation. Since the AIS reception index application is implemented in Java, a Java interface was required to launch the GNP. The Publisher constructor requires the same arguments as the publish script, with the exception that the date/time values are required as Java Calendar objects [3].

3.5   Products Management

The product management on GeoNetwork is not performed automatically by the GNP. The GeoNetwork administrator, or someone having *delete* rights designated by the administrator, has to delete products deemed too old or not pertinent anymore. Since it is possible to publish a large number of maps each day, the GeoNetwork administrator should be aware that the catalogue's size may increase quickly. It is worth mentioning that it would be possible to implement a product management mechanism to the GNP. The capability to delete products in GeoNetwork is implemented by the XML service `metadata.delete`.

---

3. `http://docs.oracle.com/javase/1.5.0/docs/api/java/util/Calendar.html`.

4 Addition of a new product

This section details the steps required to use the GNP to publish products other than the AIS index maps. It is worth modifying and using the GNP only if it is planned to repeatedly publish the same type of product, such as in the AIS reception index case. These instructions assume the reader is comfortable with Python, but not necessarily a skilled programmer.

In order to illustrate the steps, consider a use case involving a fictitious product: a map containing ship routes produced from maritime data gathered by diverse sources. Let us suppose that a new map is generated each week, for a selected area. The changing metadata about the map is the time period it covers, the bounding box of the region and also, let us suppose, a numeric uncertainty value, ranging between 0 and 1, estimating the probability of error in the routes generation.

The GNP could be used in that situation to automatically publish the map as a product on GeoNetwork. This would reduce the overhead associated to the production of metadata at each manual publication.

The following sections describe the modules to modify.

4.1 `publish.py`

As mentioned in section 3.4.1, the `publish.py` script requires at least one argument: the product's name. This argument is used internally by the application. For our use case, the product name could be *ship routes*.

The function `readArguments` has to be modified to read the required input arguments. It is done by adding an extra *if* clause:

```
if product.strip().lower() == "ship routes"
```

All input arguments are stored internally using a dictionary[4] structure, where the key is the name of the argument and the value is the argument's value. The naming is left to the developer, since it will only be used internally. However, if there is a file to upload, its full path must be stored using the key `filePath`.

For the use case, the dictionary would have the following structure (values are only for example):

product : "ship route"

---

4. Note that a Python dictionary is an unordered mapping.

filePath : ”C:\Users\Public\Data\JudeRiver_routes.png”

startTime : ”2012-11-01 20:30:00”

endTime : ”2012-11-08 20:30:00”

uncertainty : 0.11

boundingbox :

      westLon : -180.0

      eastLon : 180.0

      northLat : 90.0

      southLat : -90.0

Note that date/time is stored as a string and that `boundingbox` is also a dictionary.

4.2 `metadata template file`

It is required to make a new metadata template XML file. The best way to proceed is to first use the GeoNetwork Online Metadata Editor to create the product's metadata. Then download the metadata XML file (by clicking on *Save metadata as XML* on the Online Metadata Editor or Viewer) and use it as the `metadata template file`. The main advantage of this approach is to make sure that the product looks as wanted on GeoNetwork before starting to publish it. Note that the `metadata template file` format must be the MCP.

4.3 `info template file`

The `info template file` is simple and the one used for the AIS Indexer can be used here without any change.

4.4 `metadata.py`

It is required to make a new function to modify the required parts of the `metadata template file` with the input arguments. For our use case, the input parameters are the time period it covers, the bounding box of the region, the uncertainty value and the location in the file system of the map to publish. Let us suppose that the metadata impacted by these values are:

- title,
- abstract (which mentions the uncertainty value),
- creation and publication dates,
- bounding box (geographic extend) and
- downloadable file description.

The same metadata as for the AIS Indexer product is impacted.

The first step is to modify the `construct` function to add an *if* clause:

```
if info['product'] == "ship routes"
```

Then, the second step is to implement a new function, e.g. `shipRoutes`, that will load the `metadata template file` in memory, modify parts of its content and return the updated XML content. See `coverageMap` for an example of such a function.

The idea is to first identify in the `metadata template file` which nodes will change at each publication and then modify the required fields. For example, the following gets and modifies the bounding box west bound:

```
westBoundLongitudeNode =
findNode([geoExtentPath,gmd('westBoundLongitude'),gco('Decimal')],tree)
westBoundLongitudeNode.text = str(boundingBox['west'])
```

It is unlikely that other nodes than the ones in `coverageMap` have to be modified for a new product. If it is the case, it is strongly recommended to use the lxml toolkit to interface with XML along with the already implemented functions and variables: `gmd`, `gco`, `findNode`, ... The navigation through the nodes is much simpler with these.

Note that `info.py` does not need to be modified.

4.5 `config.py`

Only the parameters, as described in section 3.3, have to be modified according to the GeoNetwork installation and the name of the template files used.

14

References

[1] Lapinski, Anna-Liesa S. and (2011), Anthony W. Isenor (2011), Estimating Reception Coverage Characteristics of AIS, *Journal of Navigation*, pp. 609–623.

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Annex A: Template for info.xml

This is the template file used to create the `info.xml` file for the AIS indexer product. The fields modified dynamically by the application are identified by comments.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<info version="1.1">
  <general>
    <createDate>2012-08-08T16:57:29</createDate> <!-- To be replaced -->
    <changeDate>2012-08-08T08:53:44</changeDate> <!-- To be replaced -->
    <schema>iso19139.mcp</schema>
    <isTemplate>false</isTemplate>
    <format>full</format>
    <owner>admin</owner>
    <uuid>00000000-0000-0000-0000-000000000000</uuid> <!-- to be replaced
    by a valid uuid, e.g. aa78838b-49ac-46cb-8cd0-359fb0a50aaa -->
    <siteId>00000000-0000-0000-0000-000000000000</siteId> <!-- to be replaced
    by a valid uuid, e.g. aa78838b-49ac-46cb-8cd0-359fb0a50aaa -->
    <groupOwner>sample</groupOwner>
  </general>
  <categories>
    <category name="maps" />
    <category name="datasets" />
  </categories>
  <privileges>
    <group name="MIS">
      <operation name="view" />
      <operation name="download" />
      <operation name="editing" />
      <operation name="notify" />
      <operation name="dynamic" />
      <operation name="featured" />
    </group>
    <group name="sample">
      <operation name="view" />
      <operation name="download" />
      <operation name="editing" />
      <operation name="notify" />
      <operation name="dynamic" />
      <operation name="featured" />
    </group>
  </privileges>
```

```
  <public>
    <file name="thumb.png" changeDate="2012-08-08T09:54:17" />
    <!-- To be replaced by the thumbnail file name and date-->
  </public>
  <private>
    <file name="icpp09_tan.pdf" changeDate="2012-08-08T09:54:17" />
    <!-- To be replaced by the AIS reception index map file name and date-->
  </private>
</info>
```

Annex B: Template for metadata.xml

This is the template file used to create the `metadata.xml` file for the AIS indexer product. The fields modified dynamically by the application are identified by comments.

```
<?xml version="1.0" encoding="UTF-8"?>
<mcp:MD_Metadata xmlns:mcp="http://bluenet3.antcrc.utas.edu.au/mcp"
xmlns:gts="http://www.isotc211.org/2005/gts"
xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:gml="http://www.opengis.net/gml/"
xmlns:srv="http://www.isotc211.org/2005/srv"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:gmd="http://www.isotc211.org/2005/gmd"
xmlns:geonet="http://www.fao.org/geonetwork"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
gco:isoType="gmd:MD_Metadata" xsi:schemaLocation="&#xA;&#x9;&#x9;&#x9;&#x9;
http://www.isotc211.org/2005/gmd/
http://www.isotc211.org/2005/gmd/gmd.xsd
http://www.isotc211.org/2005/srv/
http://schemas.opengis.net/iso/19139/20060504/srv/srv.xsd
http://bluenet3.antcrc.utas.edu.au/mcp/
http://bluenet3.antcrc.utas.edu.au/mcp/schema.xsd&#xA;&#x9;&#x9;&#x9;">
  <gmd:language>
    <gco:CharacterString>eng</gco:CharacterString>
  </gmd:language>
  <gmd:characterSet>
  <gmd:MD_CharacterSetCode codeListValue="utf8"
  codeList=
  "http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml
  #MD_CharacterSetCode"> utf8 </gmd:MD_CharacterSetCode>
  </gmd:characterSet>
  <gmd:contact>
    <gmd:CI_ResponsibleParty>
      <gmd:individualName>
        <gco:CharacterString>Anna-Liesa S. Lapinski</gco:CharacterString>
      </gmd:individualName>
      <gmd:organisationName>
        <gco:CharacterString>DRDC Atlantic</gco:CharacterString>
      </gmd:organisationName>
      <gmd:positionName>
        <gco:CharacterString>Defence Scientist</gco:CharacterString>
      </gmd:positionName>
```

```xml
      <gmd:contactInfo>
        <gmd:CI_Contact>
          <gmd:phone>
            <gmd:CI_Telephone>
              <gmd:voice>
                <gco:CharacterString>902-426-3100 ext 180</gco:CharacterString>
              </gmd:voice>
            </gmd:CI_Telephone>
          </gmd:phone>
          <gmd:address>
            <gmd:CI_Address>
              <gmd:country>
                <gco:CharacterString>Canada</gco:CharacterString>
              </gmd:country>
              <gmd:electronicMailAddress>
                <gco:CharacterString>liesa.lapinski@drdc-rddc.gc.ca
                </gco:CharacterString>
              </gmd:electronicMailAddress>
            </gmd:CI_Address>
          </gmd:address>
        </gmd:CI_Contact>
      </gmd:contactInfo>
      <gmd:role>
      <gmd:CI_RoleCode codeListValue="principalInvestigator"
      codeList=
      "http://www.isotc211.org/2005/resources/
      Codelist/gmxCodelists.xml#CI_RoleCode">
        principalInvestigator</gmd:CI_RoleCode>
      </gmd:role>
    </gmd:CI_ResponsibleParty>
  </gmd:contact>
  <gmd:dateStamp>
    <gco:Date>2011-11-24</gco:Date><!-- to be replaced by a valid date -->
  </gmd:dateStamp>
  <gmd:metadataStandardName>
    <gco:CharacterString xmlns:gml="http://www.opengis.net/gml"
    xmlns:gmx="http://www.isotc211.org/2005/gmx">
    Australian Marine Community Profile of ISO 19115:2005/19139
    </gco:CharacterString>
  </gmd:metadataStandardName>
  <gmd:metadataStandardVersion>
    <gco:CharacterString xmlns:gml="http://www.opengis.net/gml"
```

```xml
    xmlns:gmx="http://www.isotc211.org/2005/gmx">
    MCP:BlueNet V1.4</gco:CharacterString>
  </gmd:metadataStandardVersion>
  <gmd:identificationInfo>
    <mcp:MD_DataIdentification gco:isoType="gmd:MD_DataIdentification">
      <gmd:citation>
        <gmd:CI_Citation>
          <gmd:title>
          <gco:CharacterString>
          AIS reception index for 2011-12-01 08:12:00 UTC
          to 2011-12-01 11:12:00 UTC
          </gco:CharacterString><!-- Dates to be replaced -->
          </gmd:title>
          <gmd:date>
            <gmd:CI_Date>
              <gmd:date>
                <gco:Date>2012-08-31</gco:Date><!-- To be replaced -->
              </gmd:date>
              <gmd:dateType>
              <gmd:CI_DateTypeCode codeListValue="creation"
              codeList=
              "http://www.isotc211.org/2005/resources/Codelist/
              gmxCodelists.xml#CI_DateTypeCode">creation</gmd:CI_DateTypeCode>
              </gmd:dateType>
            </gmd:CI_Date>
          </gmd:date>
          <gmd:date>
            <gmd:CI_Date>
              <gmd:date>
                <gco:Date>2012-09-07</gco:Date><!-- To be replaced -->
              </gmd:date>
              <gmd:dateType>
              <gmd:CI_DateTypeCode
              codeList=
              "http://www.isotc211.org/2005/resources/Codelist/
              gmxCodelists.xml#CI_DateTypeCode"
              codeListValue="publication">publication</gmd:CI_DateTypeCode>
              </gmd:dateType>
            </gmd:CI_Date>
          </gmd:date>
          <gmd:citedResponsibleParty>
            <gmd:CI_ResponsibleParty>
```

```xml
<gmd:individualName>
  <gco:CharacterString>Anna-Liesa S. Lapinski</gco:CharacterString>
</gmd:individualName>
<gmd:organisationName>
  <gco:CharacterString>DRDC Atlantic</gco:CharacterString>
</gmd:organisationName>
<gmd:positionName>
  <gco:CharacterString>Defence Scientist</gco:CharacterString>
</gmd:positionName>
<gmd:contactInfo>
  <gmd:CI_Contact>
    <gmd:phone>
      <gmd:CI_Telephone>
        <gmd:voice>
          <gco:CharacterString>
          902-426-3100 ext 180</gco:CharacterString>
        </gmd:voice>
      </gmd:CI_Telephone>
    </gmd:phone>
    <gmd:address>
      <gmd:CI_Address>
        <gmd:country>
          <gco:CharacterString>Canada</gco:CharacterString>
        </gmd:country>
        <gmd:electronicMailAddress>
          <gco:CharacterString>liesa.lapinski@drdc-rddc.gc.ca
          </gco:CharacterString>
        </gmd:electronicMailAddress>
      </gmd:CI_Address>
    </gmd:address>
  </gmd:CI_Contact>
</gmd:contactInfo>
<gmd:role>
<gmd:CI_RoleCode codeListValue="principalInvestigator"
codeList=
"http://www.isotc211.org/2005/resources/Codelist/
gmxCodelists.xml#CI_RoleCode">
principalInvestigator</gmd:CI_RoleCode>
</gmd:role>
  </gmd:CI_ResponsibleParty>
</gmd:citedResponsibleParty>
<gmd:citedResponsibleParty>
```

```xml
<gmd:CI_ResponsibleParty>
  <gmd:individualName>
    <gco:CharacterString>Sean Webb</gco:CharacterString>
  </gmd:individualName>
  <gmd:organisationName>
    <gco:CharacterString>DRDC Atlantic</gco:CharacterString>
  </gmd:organisationName>
  <gmd:positionName>
    <gco:CharacterString>Computer Scientist</gco:CharacterString>
  </gmd:positionName>
  <gmd:contactInfo>
    <gmd:CI_Contact>
      <gmd:phone>
        <gmd:CI_Telephone>
          <gmd:voice>
            <gco:CharacterString>902-426-3100 ext 107
            </gco:CharacterString>
          </gmd:voice>
          <gmd:facsimile gco:nilReason="missing">
            <gco:CharacterString />
          </gmd:facsimile>
        </gmd:CI_Telephone>
      </gmd:phone>
      <gmd:address>
        <gmd:CI_Address>
          <gmd:deliveryPoint gco:nilReason="missing">
            <gco:CharacterString />
          </gmd:deliveryPoint>
          <gmd:city gco:nilReason="missing">
            <gco:CharacterString />
          </gmd:city>
          <gmd:administrativeArea gco:nilReason="missing">
            <gco:CharacterString />
          </gmd:administrativeArea>
          <gmd:postalCode gco:nilReason="missing">
            <gco:CharacterString />
          </gmd:postalCode>
          <gmd:country>
            <gco:CharacterString>Canada</gco:CharacterString>
          </gmd:country>
          <gmd:electronicMailAddress>
            <gco:CharacterString>sean.webb@drdc-rddc.gc.ca
```

```
            </gco:CharacterString>
          </gmd:electronicMailAddress>
        </gmd:CI_Address>
      </gmd:address>
    </gmd:CI_Contact>
  </gmd:contactInfo>
  <gmd:role>
  <gmd:CI_RoleCode
  codeList=
  "http://www.isotc211.org/2005/resources/Codelist/
  gmxCodelists.xml#CI_RoleCode"
  codeListValue="originator">originator</gmd:CI_RoleCode>
  </gmd:role>
      </gmd:CI_ResponsibleParty>
    </gmd:citedResponsibleParty>
  </gmd:CI_Citation>
</gmd:citation>
<gmd:abstract>
  <gco:CharacterString>This is a product generated from AIS data obtained
  from the Maritime Safety and Security Information System (MSSIS).
  The product displays a color coded reception index for a particular area.
  In the area where the color coding is beige, there has been at least
  1 received AIS message in the last 6 minutes, from every known ship
  in that region.  The fading of the color towards orange, indicates
  the reduction in the number of known ships reporting at least 1 AIS
  message in the 6 minute time window.  A deep orange-red color indicates
  an area where vessels are appearing and disappearing, from an AIS
  perspective, based on the 6 minute window.  For example, around
  the outer limits of the reception areas there will be deep
  orange-red where vessels are either appearing for the first time
  (i.e., because it is the beginning of a track) or are disappearing
  (i.e., the end of a track). Black indicates no messages
  received. For further information, contact the Principal Investigator.
  </gco:CharacterString>
</gmd:abstract>
<gmd:graphicOverview>
  <gmd:MD_BrowseGraphic>
    <gmd:fileName>
      <gco:CharacterString>
      </gco:CharacterString><!-- To be replaced by the thumbnail name-->
    </gmd:fileName>
    <gmd:fileDescription>
```

```
        <gco:CharacterString>thumbnail</gco:CharacterString>
      </gmd:fileDescription>
      <gmd:fileType>
        <gco:CharacterString>
        </gco:CharacterString><!-- To be replaced by the thumbnail file type-->
      </gmd:fileType>
    </gmd:MD_BrowseGraphic>
  </gmd:graphicOverview>
  <gmd:descriptiveKeywords xlink:role="descriptiveKeywords">
    <gmd:MD_Keywords>
      <gmd:keyword>
        <gco:CharacterString>Earth Science</gco:CharacterString>
      </gmd:keyword>
      <gmd:keyword>
        <gco:CharacterString>Ocean</gco:CharacterString>
      </gmd:keyword>
      <gmd:keyword>
       <gco:CharacterString>Service</gco:CharacterString>
      </gmd:keyword>
      <gmd:keyword>
       <gco:CharacterString>Data Analysis and Visualization
       </gco:CharacterString>
</gmd:keyword>
      <gmd:keyword>
       <gco:CharacterString>Visualization/Image Processing
       </gco:CharacterString>
      </gmd:keyword>
      <gmd:type>
      <gmd:MD_KeywordTypeCode codeListValue="theme"
      codeList=
      "http://www.isotc211.org/2005/resources/Codelist/
      gmxCodelists.xml#MD_KeywordTypeCode">
      theme</gmd:MD_KeywordTypeCode>
      </gmd:type>
      <gmd:thesaurusName>
        <gmd:CI_Citation>
          <gmd:title>
            <gco:CharacterString>
            NASA/Global Change Master Directory (GCMD) Science Keywords
            Version 6.0.0.0.0
            </gco:CharacterString>
          </gmd:title>
```

```xml
<gmd:date>
  <gmd:CI_Date>
    <gmd:date>
      <gco:Date>2007-07-23</gco:Date>
    </gmd:date>
    <gmd:dateType>
    <gmd:CI_DateTypeCode
    codeListValue="revision"
    codeList=
    "http://www.isotc211.org/2005/resources/Codelist/
    gmxCodelists.xml#CI_DateTypeCode">
    revision</gmd:CI_DateTypeCode>
    </gmd:dateType>
  </gmd:CI_Date>
</gmd:date>
<gmd:citedResponsibleParty>
  <gmd:CI_ResponsibleParty>
    <gmd:individualName>
      <gco:CharacterString>LM Olsen, G Major, K Shein, J Scialdone,
      R Vogel, S Leicester, H Weir, S Ritz, T Stevens, M Meaux,
      C Solomon, R Bilodeau, M Holland, T Northcutt, RA Restrepo
      </gco:CharacterString>
    </gmd:individualName>
    <gmd:organisationName>
      <gco:CharacterString>NASA</gco:CharacterString>
    </gmd:organisationName>
    <gmd:contactInfo>
      <gmd:CI_Contact>
        <gmd:onlineResource>
          <gmd:CI_OnlineResource>
            <gmd:linkage>
              <gmd:URL>http://gcmd.nasa.gov/index.html</gmd:URL>
            </gmd:linkage>
            <gmd:protocol>
              <gco:CharacterString>
              WWW:LINK-1.0-http--link</gco:CharacterString>
            </gmd:protocol>
          </gmd:CI_OnlineResource>
        </gmd:onlineResource>
      </gmd:CI_Contact>
    </gmd:contactInfo>
    <gmd:role>
```

```xml
            <gmd:CI_RoleCode codeListValue="owner"
            codeList=
            "http://www.isotc211.org/2005/resources/Codelist/
            gmxCodelists.xml#CI_RoleCode">
            owner</gmd:CI_RoleCode>
            </gmd:role>
          </gmd:CI_ResponsibleParty>
        </gmd:citedResponsibleParty>
      </gmd:CI_Citation>
    </gmd:thesaurusName>
  </gmd:MD_Keywords>
</gmd:descriptiveKeywords>
<gmd:resourceSpecificUsage>
  <gmd:MD_Usage>
    <gmd:specificUsage gco:nilReason="missing">
      <gco:CharacterString />
    </gmd:specificUsage>
    <gmd:userContactInfo>
      <gmd:CI_ResponsibleParty>
        <gmd:individualName gco:nilReason="missing">
          <gco:CharacterString />
        </gmd:individualName>
        <gmd:organisationName gco:nilReason="missing">
          <gco:CharacterString />
        </gmd:organisationName>
        <gmd:positionName gco:nilReason="missing">
          <gco:CharacterString />
        </gmd:positionName>
        <gmd:contactInfo>
          <gmd:CI_Contact>
            <gmd:phone>
              <gmd:CI_Telephone>
                <gmd:voice gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:voice>
                <gmd:facsimile gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:facsimile>
              </gmd:CI_Telephone>
            </gmd:phone>
            <gmd:address>
              <gmd:CI_Address>
```

```
                        <gmd:deliveryPoint gco:nilReason="missing">
                          <gco:CharacterString />
                        </gmd:deliveryPoint>
                        <gmd:city gco:nilReason="missing">
                          <gco:CharacterString />
                        </gmd:city>
                        <gmd:administrativeArea gco:nilReason="missing">
                          <gco:CharacterString />
                        </gmd:administrativeArea>
                        <gmd:postalCode gco:nilReason="missing">
                          <gco:CharacterString />
                        </gmd:postalCode>
                        <gmd:country gco:nilReason="missing">
                          <gco:CharacterString />
                        </gmd:country>
                        <gmd:electronicMailAddress gco:nilReason="missing">
                          <gco:CharacterString />
                        </gmd:electronicMailAddress>
                      </gmd:CI_Address>
                    </gmd:address>
                  </gmd:CI_Contact>
                </gmd:contactInfo>
                <gmd:role>
                <gmd:CI_RoleCode
                codeList=
                "http://www.isotc211.org/2005/resources/Codelist/
                gmxCodelists.xml#CI_RoleCode"
                codeListValue="" />
                </gmd:role>
              </gmd:CI_ResponsibleParty>
            </gmd:userContactInfo>
          </gmd:MD_Usage>
        </gmd:resourceSpecificUsage>
        <gmd:resourceConstraints>
          <gmd:MD_LegalConstraints>
            <gmd:useLimitation>
              <gco:CharacterString>This data is provided by Defence R&amp;D Canada
              (DRDC) and must be considered experimental in nature. The user assumes
              the entire risk related to the use of this data. DRDC is providing
              this data "as is," and DRDC disclaims any and all warranties, whether
              express or implied, including (without limitation) any implied
              warranties of merchantability or fitness for a particular purpose.
```

```
      In no event will DRDC be liable to you or to any third party for any
      direct, indirect, incidental, consequential, special or exemplary
      damages or lost profit resulting from any use or misuse of this data.
      This data may only be used by departments or agencies within the
      Government of Canada.</gco:CharacterString>
    </gmd:useLimitation>
    <gmd:accessConstraints>
    <gmd:MD_RestrictionCode
    codeList=
    "http://www.isotc211.org/2005/resources/Codelist/
    gmxCodelists.xml#MD_RestrictionCode"
    codeListValue="copyright">copyright</gmd:MD_RestrictionCode>
    </gmd:accessConstraints>
    <gmd:accessConstraints>
    <gmd:MD_RestrictionCode
    codeList=
    "http://www.isotc211.org/2005/resources/Codelist/
    gmxCodelists.xml#MD_RestrictionCode"
    codeListValue=
    "intellectualPropertyRights">intellectualPropertyRights
    </gmd:MD_RestrictionCode>
    </gmd:accessConstraints>
    <gmd:useConstraints>
      <gmd:MD_RestrictionCode
      codeList="http://www.isotc211.org/2005/resources/Codelist/
      gmxCodelists.xml#MD_RestrictionCode"
      codeListValue="copyright">copyright</gmd:MD_RestrictionCode>
    </gmd:useConstraints>
    <gmd:useConstraints>
      <gmd:MD_RestrictionCode
      codeList="http://www.isotc211.org/2005/resources/Codelist/
      gmxCodelists.xml#MD_RestrictionCode"
      codeListValue=
      "intellectualPropertyRights">intellectualPropertyRights
      </gmd:MD_RestrictionCode>
    </gmd:useConstraints>
  </gmd:MD_LegalConstraints>
</gmd:resourceConstraints>
<gmd:language>
  <gco:CharacterString>English</gco:CharacterString>
</gmd:language>
<gmd:extent>
```

29

```xml
<gmd:EX_Extent>
  <gmd:geographicElement xlink:role="geograhpicElement">
  <!-- To be replaced by bounding box data-->
    <gmd:EX_GeographicBoundingBox>
      <gmd:westBoundLongitude>
        <gco:Decimal>-130.0</gco:Decimal>
      </gmd:westBoundLongitude>
      <gmd:eastBoundLongitude>
        <gco:Decimal>-110.0</gco:Decimal>
      </gmd:eastBoundLongitude>
      <gmd:southBoundLatitude>
        <gco:Decimal>51.0</gco:Decimal>
      </gmd:southBoundLatitude>
      <gmd:northBoundLatitude>
        <gco:Decimal>70.0</gco:Decimal>
      </gmd:northBoundLatitude>
    </gmd:EX_GeographicBoundingBox>
  </gmd:geographicElement>
  <gmd:temporalElement xlink:role="temporalElement">
    <mcp:EX_TemporalExtent gco:isoType="gmd:EX_TemporalExtent">
      <gmd:extent>
        <gml:TimePeriod gml:id="N0000000002E">
          <gml:begin>
            <gml:TimeInstant gml:id="N0000000000E">
              <gml:timePosition>2011-12-01T08:12:00
              </gml:timePosition><!-- To be replaced by start time-->
            </gml:TimeInstant>
          </gml:begin>
          <gml:end>
            <gml:TimeInstant gml:id="N0000000001E">
              <gml:timePosition>2011-12-01T11:12:00
              </gml:timePosition><!-- To be replaced by end time-->
            </gml:TimeInstant>
          </gml:end>
        </gml:TimePeriod>
      </gmd:extent>
      <mcp:currency>
      <mcp:MD_CurrencyTypeCode codeListValue="historical"
      codeList=
      "http://bluenet3.antcrc.utas.edu.au/mcp/resources/Codelist/
      gmxCodelists.xml#MD_CurrencyTypeCode">
      historical</mcp:MD_CurrencyTypeCode>
```

```
          </mcp:currency>
        </mcp:EX_TemporalExtent>
      </gmd:temporalElement>
    </gmd:EX_Extent>
  </gmd:extent>
</mcp:MD_DataIdentification>
</gmd:identificationInfo>
<gmd:distributionInfo xlink:role="distributioninfo">
  <gmd:MD_Distribution>
    <gmd:distributionFormat xlink:role="distributionFormat">
      <gmd:MD_Format>
        <gmd:name>
          <gco:CharacterString>Electronic</gco:CharacterString>
        </gmd:name>
        <gmd:version>
          <gco:CharacterString>1.0</gco:CharacterString>
        </gmd:version>
        <gmd:fileDecompressionTechnique>
          <gco:CharacterString>none</gco:CharacterString>
        </gmd:fileDecompressionTechnique>
        <gmd:formatDistributor>
          <gmd:MD_Distributor>
            <gmd:distributorContact>
              <gmd:CI_ResponsibleParty>
                <gmd:individualName gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:individualName>
                <gmd:organisationName gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:organisationName>
                <gmd:positionName gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:positionName>
                <gmd:contactInfo>
                  <gmd:CI_Contact>
                    <gmd:phone>
                      <gmd:CI_Telephone>
                        <gmd:voice gco:nilReason="missing">
                          <gco:CharacterString />
                        </gmd:voice>
                        <gmd:facsimile gco:nilReason="missing">
                          <gco:CharacterString />
```

```
                </gmd:facsimile>
              </gmd:CI_Telephone>
            </gmd:phone>
            <gmd:address>
              <gmd:CI_Address>
                <gmd:deliveryPoint gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:deliveryPoint>
                <gmd:city gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:city>
                <gmd:administrativeArea gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:administrativeArea>
                <gmd:postalCode gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:postalCode>
                <gmd:country gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:country>
                <gmd:electronicMailAddress gco:nilReason="missing">
                  <gco:CharacterString />
                </gmd:electronicMailAddress>
              </gmd:CI_Address>
            </gmd:address>
          </gmd:CI_Contact>
        </gmd:contactInfo>
        <gmd:role>
          <gmd:CI_RoleCode codeList="http://www.isotc211.org/2005/
          resources/Codelist/gmxCodelists.xml#CI_RoleCode"
          codeListValue="" />
        </gmd:role>
      </gmd:CI_ResponsibleParty>
    </gmd:distributorContact>
  </gmd:MD_Distributor>
</gmd:formatDistributor>
  </gmd:MD_Format>
</gmd:distributionFormat>

<gmd:transferOptions xmlns:gml="http://www.opengis.net/gml"
xmlns:gmx="http://www.isotc211.org/2005/gmx">
  <gmd:MD_DigitalTransferOptions>
```

```
<gmd:onLine>
<gmd:CI_OnlineResource>
<gmd:linkage>
<gmd:URL>http://localhost:8080/geonetwork/srv/en/metadata.show?
uuid=9a2a479a-f378-11e1-9941-00248cc8ee2f
</gmd:URL>
<!-- This will be updated automatically by GeoNetwork.
No need to change it-->
</gmd:linkage>
<gmd:protocol>
<gco:CharacterString>WWW:LINK-1.0-http--metadata-URL</gco:CharacterString>
</gmd:protocol>
<gmd:description>
<gco:CharacterString>Point of truth URL of
this metadata record</gco:CharacterString>
</gmd:description>
</gmd:CI_OnlineResource>
</gmd:onLine>
<gmd:onLine>
<gmd:CI_OnlineResource>
<gmd:linkage>
<gmd:URL>
http://localhost:8080/geonetwork/srv/en/file.disclaimer?
id=203&amp;fname=ais_coverage_14hours.png&amp;access=private</gmd:URL>
<!-- To be changed with to include the metadata uuid and correct GN URL-->
      </gmd:linkage>
      <gmd:protocol>
        <gco:CharacterString>WWW:DOWNLOAD-1.0-http--downloaddata
        </gco:CharacterString>
      </gmd:protocol>
      <gmd:name>
        <gmx:MimeFileType type=""></gmx:MimeFileType>
      </gmd:name>
      <gmd:description>
        <gco:CharacterString>PNG file containing the
        corresponding coverage map - Size 1.8 MB
        </gco:CharacterString>
        <!-- Change the size of the file-->
      </gmd:description>
    </gmd:CI_OnlineResource>
  </gmd:onLine>
</gmd:MD_DigitalTransferOptions>
```

```
        </gmd:transferOptions>
      </gmd:MD_Distribution>
    </gmd:distributionInfo>
    <gmd:metadataConstraints>
      <gmd:MD_LegalConstraints>
        <gmd:useLimitation>
          <gco:CharacterString>Not to be used outside of
          GeoNetwork investigation.</gco:CharacterString>
        </gmd:useLimitation>
        <gmd:accessConstraints>
          <gmd:MD_RestrictionCode codeList="http://www.isotc211.org/
          2005/resources/Codelist/gmxCodelists.xml#MD_RestrictionCode"
          codeListValue="copyright">copyright</gmd:MD_RestrictionCode>
        </gmd:accessConstraints>
        <gmd:useConstraints>
          <gmd:MD_RestrictionCode codeList="http://www.isotc211.org/
          2005/resources/Codelist/
          gmxCodelists.xml#MD_RestrictionCode"
          codeListValue="copyright">copyright
          </gmd:MD_RestrictionCode>
        </gmd:useConstraints>
      </gmd:MD_LegalConstraints>
    </gmd:metadataConstraints>
    <mcp:revisionDate>
      <gco:DateTime xmlns:gml="http://www.opengis.net/gml"
      xmlns:gmx="http://www.isotc211.org/2005/gmx">
      2012-09-07T11:51:17</gco:DateTime><!-- To be changed-->
    </mcp:revisionDate>
</mcp:MD_Metadata>
```

Annex C: GeoNetwork Installation

This section presents the procedures to install the ANZ-MEST version of the GeoNetwork and its framework on a Dell PowerEdge 2950 server with RAID 5. Although it is assumed that the operating system (in this case, Linux Ubuntu server) is already installed, the instructions and guidelines for installation are provided in the subsections below. These instructions were tested on a standard server hardware but not specifically on a Dell PowerEdge server. Some web links are provided below to prevent some potential problems related to the PowerEdge server. In case of a problem, please consult your Information Technology (IT) administrator or contact OODA Technologies for support.

The instructions provided are based on the assumption that the Dell PowerEdge 2950 server elements are:
- 2 Dual Core Intel® Xeon ® 5160 processors, 4MB Cache, 3.00GHz, 1333MHz FSB
- 8Gigabyte (GB) 533MHz (4x2GB), Dual Ranked DIMMs
- Integrated SAS/SATA RAID 5, PERC 5/i Integrated
- 4 SAS Hard Drives, 300GB, 3.5-inch, 10K RPM Hard Drives
- PERC 5/i, x6 Backplane, Integrated Controller Card
- Dual Embedded Broadcom® NetXtreme II 5708 Gigabit Ethernet NIC
- 24X IDE CD-RW/DVD ROM Drive

The maximum memory for this server is 32 GB. Currently it has 4 slots with 2 GB memory each which totals 8 GB. It is recommended to fill the remaining 4 empty slots with the same memory module to increase the memory to a minimum of 16 GB. Another and better option would be to put 4 GB memory modules in each slot for a total of 32 GB.

Before installation

Although the installation procedure could work without firmware update, it is highly recommended to update the BIOS and RAID card firmware. This is especially important if you want the server to be as reliable as possible and to make sure your Linux installation goes smoothly. The BIOS version should be updated to A21 (BR168380.exe). The firmware for the PERC/QC RAID Card should be updated to 2.8, using DELL support site [5]. If you did not update the firmware and you encountered a problem (e.g. during RAID configuration), update the firmware and restart from the beginning. Updating firmware could be tricky, please request the assistance of your IT administrator.

If not already done, connect a keyboard and a screen to the PowerEdge.

---

5. `http://support.dell.com`

RAID configuration

Configuration of the RAID array is done using the BIOS but mostly the PERC firmware. This video (`http://www.youtube.com/watch?v=044qCZNiUJE`) will provide you with valuable instructions for setting up the RAID 5 array. Before configuring the array, make sure that all valuable data (if any) from the array is backed up as the configuration process will erase the drives in favor of the new installation. For a tutorial on the different RAID configurations: `http://www.youtube.com/watch?v=AuwD7EhJOdc`.

To access the BIOS, hold down `F2` or `F10` at BootUP. To access the PERC 5/i RAID firmware, hold down `Crtl+R` at BootUP.

Here are some links that could help you to solve some of the RAID issues you may encounter:

- Detailed instructions on how to use the PERC 6 (not 5) integrated BIOS configuring utility[6].
- If the RAID is not visible, ensure that the nic (bnx2) and the controller driver (mpt2sas) are in the initial RAM disk (initrd) file for it to see the perc controllers[7].
- If at the first boot, the disks are still not accessible, you can reset everything by entering the BIOS and resetting all settings to default and reboot. The RAID setup prompt should pop up for you upon first boot.
- Information on solving RAID problems on PowerEdge[8].

If major problems are encountered while trying to configure the RAID array, other options are still applicable for salvaging the PowerEdge:

- Using a Software RAID strategy instead of using the PERC RAID card.
- Using a couple of hard drives from the array, used as a non-RAID solution. It would be sufficiant for the purpose of the GeoNetwork.

Ubuntu server installation and configuration

We recommend using Ubuntu server 12.04 for the GeoNetwork server operating system. This version is Long Term Support (LTS) version which will be supported for the next five years. This version performed well in a standard server test. Insert the Ubuntu Server CD and boot the PowerEdge server. If necessary, use the BIOS to give priority to the CD drive in the boot sequence. Make sure that the computer on which you install Ubuntu has access to the Internet, if a proxy is required, the installation process will allow you to enter the proxy coordinates. Use the `TAB` and the arrows to navigate in the installation interface. Perform the following steps:

---

6. `http://www.thegeekstuff.com/2009/05/dell-tutorial-create-raid-using-perc-6i-integrated-bios-configuration-utility`
7. `http://www.ducea.com/2009/03/02/debian-lenny-pxe-installation-on-dell-poweredge-19502950-servers-bnx2-annoyances`
8. `http://blog.gmane.org/gmane.linux.hardware.dell.poweredge/month=20090301`

1. **Installation language:** Select English.

2. **Main menu:** Select the Install Ubuntu Server.

3. **Languages:** Select English.

4. **Location:** Select Canada.

5. **Keyboard layout:** Select No.

6. **Keyboard layout:** Select English (US).

7. **Keyboard layout:** Select English (US) and wait a few seconds for the next panel.

8. **Host name:** Enter the hostname of the new server (e.g. geoserver).

9. **Administrator name:** Enter the full name of the administrator for this machine (e.g. Sean Webb or GeoNetwork Administrator).

10. **Administrator username:** Enter the username used by the GeoNetwork administrator (e.g. geoadmin).

11. **Administrator password:** Enter a nontrivial password for the GeoNetwork administrator account.

12. **Administrator password confirmation:** Repeat the password.

13. **Encryption:** Select No. You may select Yes but this option was not tested and can have unknown consequence.

14. **Timezone:** If the proposed timezone is correct, select Yes, if not, select No then select Halifax.

15. **Disk partition and RAID:** It is recommended to select `Manual`. In this section, you have to set your disk partition configuration. A typical setup is to set a bootable Ext4 `/boot` partition of 10GB, a `/swap` partition of 10GB and the rest will become the root `/` Ext4 partition. Also, the IT administrator could either decide to use the PERC RAID controller or to use instead a Software RAID implementation, both being implementable on PowerEdge. This stage shoud be supervised by the IT administrator or revisited if installation failed.

16. **Confirmation:** When partitioning is completed, select Yes to confirm writing the partition to disk and wait a few minutes while the base system is being installed.

17. **Proxy selection:** DRDC is using a proxy site for connection to the Internet, input the coordinates on that line, if not, leave the field empty and wait a few minutes for the next panel.

18. **Automatic update:** Select `No automatic update`.

19. **Manual package selection:** DO NOT SELECT ANYTHING, use the TAB key to select `Continue` and then, type `Enter` and wait for the installation process to complete.

20. **Grub:** Select Yes.

21. **Reboot:** Wait for the automatic reboot, remove the CD after ejection and close the casing and then select `Continue`.

22. **Network configuration:** First, log in using the username and password defined during the installation process. Become root with the command `sudo su` for which you will need to enter your password again. Using your favorite command line editor (e.g. `vi`), edit the file `/etc/network/interfaces`. First, replace the word `dhcp` by `static`. Add the following 4 new lines at the end of the file and replace the numerical values by the parameters provided by your IT Administrator (IP address, netmask, network gateway and local DNS server):

    ```
    address 192.168.0.123
    netmask 255.255.255.0
    gateway 192.168.0.1
    dns-nameservers 192.168.0.1 8.8.8.8
    ```

23. **`/etc/hosts` modification:** Edit the `/etc/hosts` file:

    (a) Replace `127.0.1.1` by `127.0.0.1`

    (b) Add a line after the first one, stating the IP address and the hostname you chose above (e.g. `192.168.0.123 geoserver`)

    (c) Save your modifications and exit.

24. **Remote access:** Ask your IT Administrator if you need to create a `hosts.allow` file (listing the IPs, separated by spaces, of the computers allowed to log in directly to the server for administration purposes).

25. **Reboot:** Type `reboot`.

26. **DNS configuration:** Ask your IT administrator to add the IP and hostname of the new GeoNetwork in the local DNS server so that the hostname is resolved when used by the researchers̕ browsers.

The server is now installed and configured for networking. For a good reference on how to manage an Ubuntu server, consult the document `https://help.ubuntu.com/12.04/serverguide/serverguide.pdf`.

Software package installation and configuration

The following instructions are for installing and configuring the software packages Java 1.6 and MySQL 5.5 which are required for running the GeoNetwork. Each time you use the `apt-get` command, you will be invited to confirm the installation of the package and its dependencies. Type `Y` and type `Enter` on each occasion or just type `Enter` to use the default value.

1. **Login:** Login on the server.

2. **For mounting USB keys:**

   ```
   sudo apt-get install usbmount
   ```

   It is highly recommended to edit the `/etc/usbmount/usbmount.conf` file and remove the `sync,` option. It will speedup access to USB keys.

3. **Installation utilities:** `sudo apt-get install python-software-properties`

4. **JAVA installation:** Insert the GeoNetwork installation CD and execute the command:

   (a) `cp /media/cdrom/GeoNetwork/java_installer.sh ∼`

   (b) `sudo ∼/java_installer.sh`

   Wait for several minutes as the scripts download the Java packages from internet and configure them as Ubuntu packages. When completed, execute the following commands:

   (a) `sudo apt-get install sun-java6-jdk`

   (b) `sudo apt-get install ant`

5. **MySQL installation:** Insert the GeoNetwork installation CD and execute the command:

   ```
   sudo apt-get install mysql-server
   ```

   This instruction will install MySQL 5.5, you will be asked to choose a password, **REMEMBER YOUR PASSWORD** as you will need it for your GeoNetwork configuration.

6. **Final update:** Execute the commands:

   (a) `sudo apt-get update` (this updates the software lists available)

   (b) `sudo apt-get upgrade` (install the latest versions of the packages installed)

MySQL, Tomcat and ANZ-MEST installation and configuration

These are the simplified instructions for installing GeoNetwork. These assume that the GeoNetwork installation CD is still in the CD/DVD drive:

1. `cd /opt`

2. `sudo tar xzpf /media/cdrom/GeoNetwork/geonetwork.tgz`

3. `mysql -u root -p < /media/cdrom/GeoNetwork/geonetwork_mysql_db.sql`

The above MySQL instruction will prompt you to enter your MySQL password.

Edit the following files using `sudo vi`:

1. `/opt/BlueNetMEST/tomcat/conf/context.xml`

2. `/opt/BlueNetMEST/web/geonetwork/WEB-INF/config.xml`

3. `/opt/BlueNetMEST/dist/web/geonetwork/WEB-INF/config.xml`

and replace any occurence of the string `irasm902` by your MySQL password.

The following instructions will ensure that the GeoNetwork server starts automatically when rebooting the PowerEdge:

1. `sudo cp /media/cdrom/GeoNetwork/geonetwork /etc/init.d`

2. `cd /etc/rc1.d`

3. `sudo ln -s ../init.d/geonetwork K98geonetwork`

4. `cd /etc/rc2.d`

5. `sudo ln -s ../init.d/geonetwork S98geonetwork`

At this point, restart the GeoNetwork server:

```
sudo /etc/init.d/geonetwork start
```

All default passwords are listed in the `geonetwork_credentials.txt` file on the installation CD. It is recommended that you modify these passwords and keep a record of the values.

Execution and testing

To check if GeoNetwork is running:

```
ps -elf |grep java
```

You should see a single Java process. Finally, you can connect remotely to the server using any browser using the following URL path:

```
http://geoserver:8080/geonetwork
```

where `geoserver` is the hostname you chose for hosting the GeoNetwork site. The web browsers currently supported by GeoNetwork are Internet Explorer v6+ (Windows), Firefox v1.5+ (All), Safari v3+ (Mac OS X Leopard). Note that Google Chrome was used for this investigation without any noticeable problem.

If the URL path is not working, verify the connectivity of the server to the network with commands such as `ping geoserver`. Check also if `geoserver` is recognized by your local DNS server. Contact your IT Administrator to solve this issue.

If for some reason, you need to start GeoNetwork manually:

```
sudo /etc/init.d/geonetwork start
```

To stop GeoNetwork manually:

```
sudo /etc/init.d/geonetwork stop
```

If you need to adjust the Java memory parameters `Xms` and `Xmx`, edit the file:

```
/opt/BlueNetMEST/bin/start-geonetwork-tomcat.sh
```

Tomcat errors are loggued in `/opt/BlueNetMEST/tomcat/logs/catalina.out`. GeoNetwork logs are located in `/opt/BlueNetMEST/bin/logs/geonetwork.log`. All other Ubuntu log files are located in the `/var/log` directory.

For further details about GeoNetwork configuration, refer to section 7 of [6]. For instance, you may have to configure GeoNetwork to allow harvesting from a proxy protected site. Note that the current installation already contains a group named MIS and some users. Their logins/passwords are also in the `geonetwork_credentials.txt` file on the installation CD.

Refer to the annex of [6] for a complete GUI-based installation of ANZ-MEST . The current installation instructions are simplified for a machine without GUI access.

List of symbols/abbreviations/acronyms/initialisms

AIS   Automatic Identification System

ANZ   Australia and New Zealand

DBMS   Database Management System

DND   Department of National Defence

DRDC   Defence Research and Development Canada

FTP   File Transfer Protocol

GB   Gigabyte

GNP   GeoNetwork Publisher

HTML   HyperText Markup Language

HTTP   Hypertext Transfer Protocol

ID   Identification Number

IP   Internet Protocol

IT   Information Technology

ITE   Integrated Testing Environment

MCP   Marine Community Profile

MEF   Metadata Exchange Format

MIS   Maritime Information Support

MSA   Maritime Situational Awareness

URL   Uniform Resource Locator

UUID   Universally Unique Identifier

WMS   Web Map Service

XML   eXtensible Markup Language